

Original Research

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Does Disaster Severity Have a Long-Term Effect on Survivors' Disaster Preparedness? A Survey a Decade after the 2008 Wenchuan Earthquake in China

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Abstract

Objectives: Disaster experiences have long-term effects on disaster preparedness. This study examined the long-term (10-y) effect of disaster severity of the 2008 Wenchuan earthquake on survivors' disaster preparedness and the moderating effects of household vulnerability.

Methods: The data were collected in January 2018 covering 30 counties in Wenchuan earthquake-stricken areas. The dependent variable was survivors' disaster preparedness (including overall, material, knowledge and awareness, and action preparedness) in 2018. Disaster severity included survivors' housing damage and county death rate caused by the earthquake in 2008. Household vulnerability is a set of conditions that negatively affects the ability of people to prepare for and withstand disaster, proxied by households' per-capita income and the highest years of schooling of household members. We performed multivariable linear regression models to answer the research questions.

Results: A higher county death rate was associated with better overall preparedness ($\beta = 0.043$; $P < 0.05$) and knowledge and awareness preparedness ($\beta = 0.018$; $P < 0.05$), but housing damage was not significantly associated with disaster preparedness. The positive association of county death rate with overall preparedness ($\beta = -0.065$; $P < 0.05$) becomes weaker when a household has a higher per-capita income. Also, with the household per-capita income increasing, the associations of county death rate with material preparedness ($\beta = -0.037$; $P < 0.05$) and action preparedness ($\beta = -0.034$; $P < 0.01$) become weaker.

Conclusions: Disaster severity has positive and long-term effects on survivors' disaster preparedness. Also, the positive and long-term effects are affected by household vulnerability. Specifically, the positive and long-term effects of disaster severity on disaster preparedness are more substantial when a household is more vulnerable.

Introduction

Natural disasters are considerable events that cause widespread destruction to the environment and loss of life.¹ Disasters usually cause injuries and deaths, property losses, and infrastructure destruction, and can lead to short-term and long-term adverse effects on human health and well-being.^{1–3} Existing literature indicated that disasters could result in post-disaster stress disorder,^{4,5} damage survivors' quality of life,^{6,7} and affect survivors' health in the long run.⁸ One of the most effective means to deal with threats caused by natural disasters is to improve household disaster preparedness capacity.⁹ Being prepared for disasters can minimize damage to human health, lives, and property, significantly improving residents' happiness, life satisfaction, and general health status.¹⁰

Disaster preparedness can be defined as the knowledge, capabilities, and actions “to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current hazard events or conditions”.¹ Sufficient household preparedness for disaster reduction and prevention can effectively decrease the losses and harmful impacts of disasters, and shorten recovery time after disasters.¹¹ Previous studies showed that disaster severity generally affected survivors' disaster preparedness strategies when dealing with possible disasters in the future. Survivors who experienced financial or health damage during disasters tend to be well prepared to deal with disaster events.¹² In the Great East Japan Earthquake, compared with others who did not suffer damage, survivors who experienced direct/indirect damage from the earthquake were relatively better prepared, mainly in basic preparedness, energy/heat preparedness, and evacuation preparedness.¹³ In the Typhoon Mangkhut, the severity of damage affected survivors' willingness to prepare for future typhoons.¹⁴ In the Loma Prieta earthquake, survivors

with little or no losses maintain lower risk awareness and may respond less to disaster warnings.¹⁵

Also, previous studies examined the longstanding (several months or even years after the disaster) associations between disaster severity and disaster preparedness.^{12–14,16–18} However, only a few studies have discussed the long-term (5 y or more) effects of disaster severity on disaster preparedness, and the results were inconsistent. Eight years after the Wenchuan earthquake, survivors located in severely affected areas still have a strong tendency to purchase insurance to avoid disaster risk and tend to relocate their residences to prevent and avoid disaster events. The association of household risk perception with their aspiration to purchase insurance and relocation intention was significant and positive.¹⁹ Eight years after the Loma Prieta earthquake, the effect of the severity of disaster damage on enterprises' disaster preparedness actions and activities was still significantly positive-going.¹⁶ However, a previous study in America assessed the relationship between disaster exposure as well as loss over the past 30 y and state-level preparedness. It was found that, at the state level, disaster preparedness was not associated with disaster deaths and injuries.²⁰

Vulnerability, which can be considered the likelihood of an individual or household encountering certain risks, provides a wider perspective in disaster preparedness assessment studies.²¹ Effects on disaster preparedness of disaster severity, may vary among survivors with different levels of household vulnerability. Household vulnerability is a set of conditions that negatively affects the ability of people to prepare for and withstand disaster.^{22,23} Household vulnerability may serve as a moderating variable, affecting the effect of disaster severity on disaster preparedness. Numerous studies measured household vulnerability using household economic situation and household members' educational status.^{24–26} Research has shown that households with high levels of household vulnerability are more susceptible to disasters, experiencing property damage and even casualties.²⁶ Therefore, this study used household vulnerability to explore the moderating mechanisms underlying the association between disaster severity and disaster preparedness. Existing research has shown that higher household income was associated with better disaster preparedness.^{27,28} It is partly because, compared with low-income households, high-income households had a more robust economic capacity to undertake disaster preparedness activities and actions. Disaster survivors with sufficient resources may have greater self-efficacy or confidence to cope with threats from the disasters and be more likely to take aggressive defensive actions.^{29,30} In addition, education may increase residents' awareness about the seriousness of disaster damage and enhance the learning of preparedness knowledge and skills and the ability to obtain disaster information.^{31,32} Disaster survivors with higher education levels showed better prevention, preparation, and action in response to natural disasters.³²

China has suffered severe losses from various natural disasters now and then.^{33,34} The Wenchuan earthquake occurred in Sichuan Province on May 12, 2008. It is the most destructive earthquake with the broadest range, the heaviest disaster loss, and the most challenging disaster relief since the establishment of the People's Republic of China. Existing literature indicated that disaster experiences have effects on disaster preparedness, whether in a short time or a long time (ie, from several months to 5 y).^{11,13,35,36} However, little is known about the long-term effects of disaster severity on disaster preparedness a decade after a disaster and the moderating effects of household vulnerability.

Exploring the long-term effects of disaster severity on disaster preparedness for disaster prevention, mitigation, and disaster management is highly essential and significant. Therefore, using data from survivors of the Wenchuan earthquake, we aimed to examine (1) whether the severity of the earthquake in 2008 had a long-term effect on survivors' disaster preparedness in 2018 and (2) whether the long-term effect of disaster severity on disaster preparedness was affected by survivors' household vulnerability in 2018.

Methods

Data

The data used are from the survey of Reconstruction and Development of Wenchuan Earthquake Area (2018), conducted in January 2018 by means of a household survey. The survey was approved and conducted by the Chinese Academy of Science and Technology for Development (CASTED) and Fafo in Norway. This survey covered 30 counties (districts) of the Chengdu, Mianyang, Guangyuan, and A'ba Prefectures in Sichuan Province, classified by the government as either "heavily affected" (zhong zaiqu) or "severely destroyed" (jizhong zaiqu) areas. Probability Proportionate to Size Sampling was conducted in this survey to select households. Based on the questionnaire, face-to-face interviews were performed within each household. In each household, the Kish table was used to select participants so that each eligible person has an equal probability of selection into the survey sample. After eliminating samples with missing values in the corresponding variables, the analytical sample size was 1420 households. In addition, the data on county death rate caused by the Wenchuan earthquake was from a book named "Sichuan earthquake relief record of Wenchuan earthquake—Disaster situation."³⁷

Variables

Disaster preparedness

Based on a previous study, the following 11 preparedness activities were used to measure disaster preparedness, including 3 forms (material, knowledge and awareness, and action).³⁸ The measurement of disaster preparedness is presented in Table 1. The answer to the 11 preparedness activities was coded as 1 (Yes) or 0 (No). The overall preparedness is the total of the 11 items, and the total of items in each sub-category was used as the disaster preparedness indicator of the sub-category. The higher score indicates more active preparedness.

Disaster severity

Disaster severity was measured by county death rate and housing damage. The county death rate was calculated as the proportion of deaths caused by the Wenchuan earthquake in each county to the total population of that county in 2008. Housing damage level was measured by self-rated severity of the damage to the house caused by the 2008 Wenchuan earthquake, with the coding ranging from 1 (collapse) to 5 (no damage). Among them, "slight damage" and "no damage" were merged into 1 group due to their small proportion.

Household vulnerability

Household vulnerability was measured by the households' per-capita income and the highest years of schooling among the household members. Per-capita income was defined as the annual household income in 2018 divided by the number of household

Table 1. Measurement of disaster preparedness

Forms	Items
Material preparedness	Having emergency light or flashlight.
	Having enough food and water for family within 3 d.
	Having emergency kit.
	Having radio using batteries.
	Having extinguisher.
Knowledge and awareness preparedness	Knowing how to turn off the gas, electricity, or water in your home.
	Knowing how to evacuate your residence safely in an emergency.
	Knowing where the emergency shelter is.
Action preparedness	Having partaken in disaster training or drills.
	Having ever discussed with relatives, friends, or others about what to do if earthquake occurred.
	Former or current volunteer or member of the Red Cross, CERT, or other disaster related organizations.

members in 2018. The highest years of schooling referred to the highest years of schooling among all household members in the same household.

Control Variables

In this study, control variables were also included in the analysis, including gender (1 = male; 0 = female), age, marital status (1 = single/divorced/widowed; 0 = married), political status (1 = Communist Party member; 0 = None-Communist Party member), and the residential area (1 = urban; 0 = rural). Based on previous studies, these variables were primary indicators being proved to be associated with disaster preparedness.^{9,11,38} Specifically, Ma et al. showed that gender and age were significantly correlated with residents' disaster knowledge and skill readiness.⁹ Also, Malmin suggested that married individuals were more likely to be fully prepared for disasters.¹¹ Additionally, Chai et al. showed that residents with party membership were more likely to be prepared for disasters, and there are significant differences in material disaster preparedness between urban and rural areas.³⁸

Statistical Analysis

The description of disaster preparedness (including overall, material, knowledge and awareness, and action disaster preparedness), disaster severity (including the county death rate and housing damage), and other characteristics of the respondents was first presented through descriptive analysis. Additionally, multi-variable linear regression models were used to explore the association between disaster severity and disaster preparedness. Furthermore, the interaction terms between household vulnerability (including per-capita income and the highest years of schooling) and disaster severity were used to test whether the association between disaster severity and disaster preparedness was affected by household vulnerability. The interaction terms were examined 1 by 1 in separated models. All the control variables were adjusted in all the regression models.

Data analysis was implemented in Stata 15, and the 2-tailed *P*-value < 0.05 was assessed and identified as the lowest significance level in this study.

Table 2. Descriptive of variables (*N* = 1,420)

Variables	Variables definition and values	Mean (SD)/percentage
Dependent variables		
Overall preparedness [0-10]		4.742 (1.691)
Material preparedness [0-5]		1.806 (1.029)
Knowledge and awareness preparedness [0-3]		2.343 (0.664)
Action preparedness [0-3]		0.592 (0.725)
Independent variable		
County death rate (%) [0.002-14.260]		1.243 (3.098)
Housing damage [1-4]	1 = Collapse	23.31%
	2 = Severely damaged	25.21%
	3 = Medium damaged	19.86%
	4 = Slightly damaged/No damage	31.62%
Moderating variables		
Per-capita income (10 thousand yuan) [0-33.200]		0.998 (2.045)
The highest years of schooling [0-19]		9.933 (3.929)
Control variables		
Gender [0-1]	0 = Female	50.77%
	1 = Male	49.23%
Age [18-92]		55.635 (15.237)
Marital Status [0-1]	0 = Single/divorced/widowed	19.72%
	1 = Married	80.28%
Political status [0-1]	0 = None-Communist Party member	91.27%
	1 = Communist Party member	8.73%
Area [0-1]	0 = Urban	21.97%
	1 = Rural	78.03%

Results

Descriptive Statistics

Descriptive results are in Table 2. The average score of overall disaster preparedness of respondents was 4.742 out of 11, indicating that their disaster preparedness was poor. Additionally, among the respondents, the average score of material preparedness was 1.806 out of 5, knowledge and awareness preparedness was 2.343 out of 3, and action preparedness was 0.592 out of 3, respectively. The average earthquake death rate in each county in 2008 was 1.243%. Of all the respondents, 23.31%, 25.21%, 19.86%, and 31.62% responded with housing damage as "collapse," "serious damaged," "medium damaged," and "slightly damaged/no damage," respectively.

The average household per-capita income was 9980 yuan (1508.15USD) per year. The mean of the highest years of schooling was 9.93 y. Nearly 50% of the respondents were males (49.23%), and more than three-quarters of respondents were married (80.28%). The average age of respondents was approximately 56. Of all the respondents, 8.73% were Communist Party members, and more than three-quarters lived in rural areas (78.03%).

Table 3. Association between disaster severity and disaster preparedness ($N = 1,420$)^a

	Model 1	Model 2	Model 3	Model 4
	Overall preparedness	Material preparedness	Knowledge and awareness preparedness	Action preparedness
County death rate (%)	0.043*	0.012	0.018*	0.013
	(0.020)	(0.013)	(0.008)	(0.009)
Housing damage (refer to: Collapse)				
Serious damaged	0.095	0.057	-0.0004	0.039
	(0.123)	(0.078)	(0.050)	(0.053)
Medium damaged	-0.139	-0.002	-0.074	-0.063
	(0.132)	(0.083)	(0.053)	(0.057)
Slightly damaged/No damage	0.088	0.042	0.027	0.020
	(0.123)	(0.077)	(0.049)	(0.053)
Per-capita income (logarithm)	0.373***	0.135*	0.084*	0.155***
	(0.090)	(0.057)	(0.036)	(0.039)
The highest years of schooling	0.051***	0.027***	0.013**	0.012*
	(0.012)	(0.008)	(0.005)	(0.005)
Gender (refer to: Female)				
Male	0.186*	0.053	0.108**	0.025
	(0.087)	(0.055)	(0.035)	(0.037)
Age	-0.011***	0.004	-0.006***	-0.009***
	(0.003)	(0.002)	(0.001)	(0.001)
Marital status (refer to: single/divorced/widowed)				
Married	0.144	0.095	0.123**	-0.075
	(0.110)	(0.069)	(0.044)	(0.047)
Political status (refer to: None-Communist Party member)				
Communist Party member	0.882***	0.375***	0.125*	0.382***
	(0.157)	(0.099)	(0.063)	(0.067)
Area (refer to: Rural)				
Urban	-0.137	-0.074	0.023	-0.086
	(0.110)	(0.070)	(0.044)	(0.047)
Constant	4.402***	1.154***	2.290***	0.958***
	(0.289)	(0.182)	(0.116)	(0.124)
R^2	0.1060	0.0404	0.0674	0.1081
adj. R^2	0.0990	0.0329	0.0601	0.1012

^aStandard errors in parentheses.

* $P < 0.05$.

** $P < 0.01$.

*** $P < 0.001$.

Long-Term Effects

The regression results are in Table 3. County death rate was significantly and positively associated with overall preparedness ($\beta_{\text{Model1}} = 0.043$; $P < 0.05$), knowledge and awareness preparedness ($\beta_{\text{Model3}} = 0.018$; $P < 0.05$). However, the correlation between housing damage and overall preparedness or any sub-category of preparedness was not significant. Regarding household vulnerability, per-capita income and the highest years of schooling were significantly and positively associated with the overall and all 3 sub-categories of disaster preparedness. In other words, households with higher household per-capita income and the highest years of schooling were more likely to conduct disaster preparedness (including overall preparedness, material preparedness, knowledge and awareness preparedness, and action preparedness).

Moderating Effects

The moderating effect of household vulnerability on the long-term effect of disaster severity on disaster preparedness was further examined. Table 4 shows that the long-term effect of county death rate on overall disaster preparedness, material preparedness, and action preparedness was affected by per-capita income. The interaction term between per-capita income and county death rate was significantly and negatively associated with overall preparedness ($\beta_{\text{Model1}} = -0.065$; $P < 0.05$), material preparedness ($\beta_{\text{Model2}} = -0.037$; $P < 0.05$), and action preparedness ($\beta_{\text{Model4}} = -0.034$; $P < 0.01$). However, neither the long-term effect of county death rate on overall disaster preparedness nor any sub-category of disaster preparedness was affected by the highest years of schooling (Appendix Table 1). Also, neither the long-term effect of housing damage on overall disaster preparedness nor any sub-category of

Table 4. Moderating effects of per-capita income on the association between county death rate and disaster preparedness ($N = 1420$)^a

	Model 1	Model 2	Model 3	Model 4
	Overall preparedness	Material preparedness	Knowledge and awareness preparedness	Action preparedness
County death rate (%)	0.084** (0.026)	0.036* (0.017)	0.014 (0.011)	0.035** (0.011)
Housing damage (refer to: Collapse)				
Serious damaged	0.111 (0.123)	0.066 (0.078)	-0.002 (0.050)	0.047 (0.053)
Medium damaged	-0.128 (0.132)	0.004 (0.083)	-0.075 (0.053)	-0.057 (0.056)
Slightly damaged/No damage	0.103 (0.123)	0.050 (0.077)	0.026 (0.049)	0.027 (0.052)
County death rate (%) * per-capita income (Logarithm)	-0.065* (0.026)	-0.037* (0.017)	0.006 (0.011)	-0.034** (0.011)
Per-capita income (logarithm)	0.461*** (0.097)	0.184** (0.061)	0.075 (0.039)	0.201*** (0.041)
The highest years of schooling	0.050*** (0.012)	0.026*** (0.008)	0.013** (0.005)	0.011* (0.005)
Gender (refer to: Female)				
Male	0.186* (0.087)	0.053 (0.055)	0.108** (0.035)	0.025 (0.037)
Age	-0.011*** (0.003)	0.004 (0.002)	-0.006*** (0.001)	-0.009*** (0.001)
Marital status (refer to: single/divorced/widowed)				
Married	0.137 (0.110)	0.091 (0.069)	0.124** (0.044)	-0.079 (0.047)
Political status (refer to: None-Communist Party member)				
Communist Party member	0.875*** (0.156)	0.371*** (0.099)	0.125* (0.063)	0.378*** (0.067)
Area (refer to: Rural)				
Urban	-0.130 (0.110)	-0.070 (0.069)	0.022 (0.044)	-0.082 (0.047)
Constant	4.363*** (0.289)	1.132*** (0.182)	2.294*** (0.116)	0.937*** (0.124)
R ²	0.1098	0.0437	0.0676	0.1140
adj. R ²	0.1022	0.0355	0.0596	0.1064

^aStandard errors in parentheses.* $P < 0.05$.** $P < 0.01$.*** $P < 0.001$.

disaster preparedness was affected by household vulnerability (including per-capita income and the highest years of schooling) (Appendix Tables 2-3).

The significant moderating effects of per-capita income are plotted in Figure 1 according to the results of Model 1, Model 2, and Model 4 in Table 4. Specifically, with the increase in county death rate, the difference in overall preparedness between households with low per-capita income and households with high per-capita income narrowed (Figure 1A). In other words, compared with households with high per-capita income, the county death rate was more strongly associated with overall preparedness for households with low per-capita income. The same patterns were also shown for material preparedness (Figure 1B) and action preparedness (Figure 1C).

Discussions and Conclusions

Disasters pose a threat to human health and safety. Strengthening disaster preparedness is of great significance for public health. This study examined the long-term (10-y) effect of disaster severity of the Wenchuan earthquake on survivors' disaster preparedness and the moderating effects of household vulnerability.

We found that disaster severity had positive and long-term effects on survivors' disaster preparedness. Even a decade after the 2008 Wenchuan earthquake, survivors' disaster preparedness in 2018 was still affected by the severity of the disaster damage in 2008. At the county level, the higher the county death rate in 2008, the better survivors' disaster preparedness in 2018 would be. Specifically, survivors living in counties with a higher county death rate had better overall preparedness and knowledge and awareness

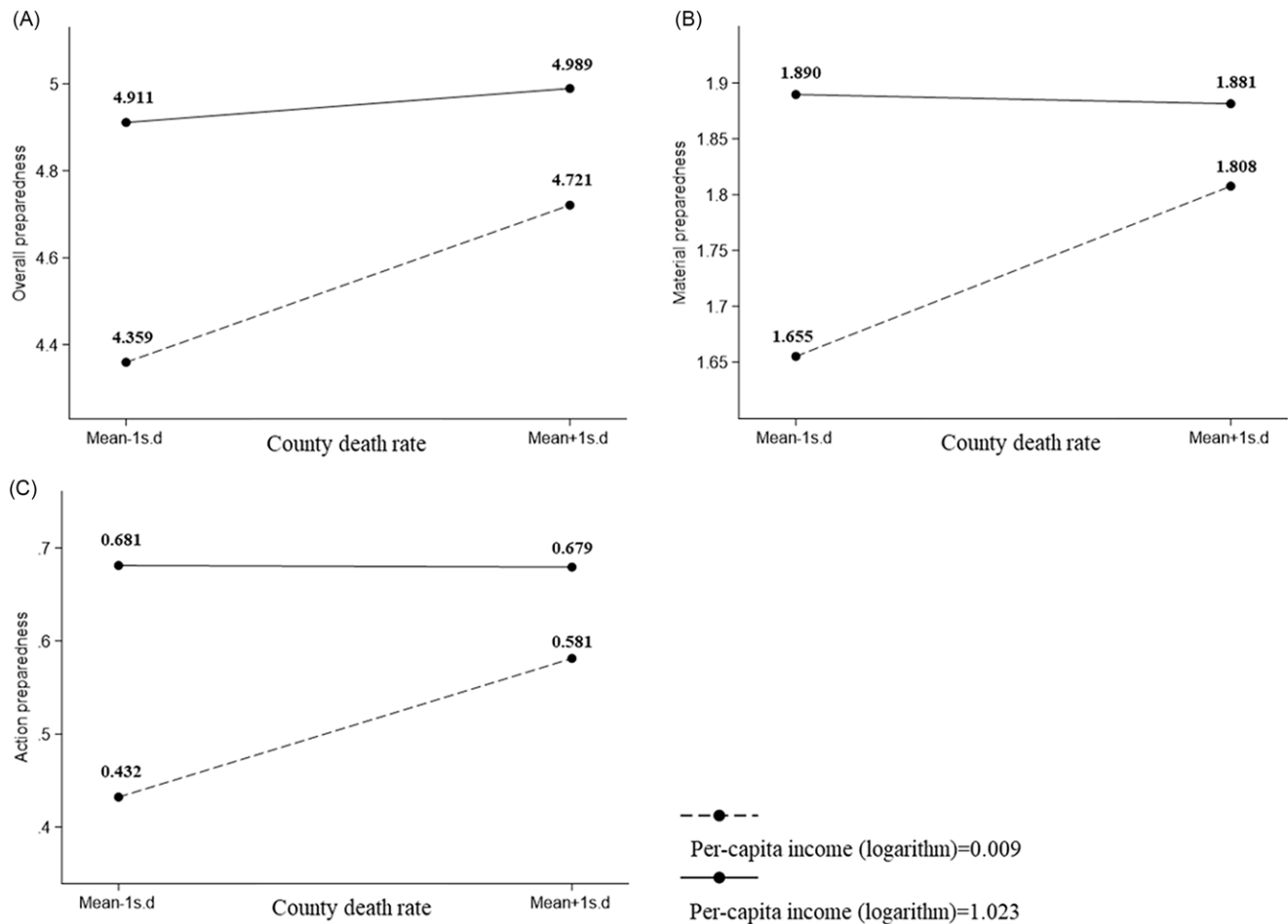


Figure 1. Moderating effects of per-capita income.

preparedness than those living in counties with a lower county death rate. As the casualties caused by the earthquake were a huge shock for the survivors, emotionally and psychologically, it may be difficult for the survivors to recover from the casualties. However, the results showed that survivors' housing damage in 2008 was not significantly related to disaster preparedness in 2018.

Additionally, our study further examined the moderating role of household vulnerability between disaster severity and disaster preparedness. The results indicated that the positive and long-term effects of county death rate on disaster preparedness were affected by survivors' household per-capita income. Specifically, the positive association of county death rate with overall preparedness becomes weaker when a household has a higher per-capita income. Also, with the household per-capita income increasing, the associations of county death rate with material preparedness and action preparedness become weaker. It might be because people with higher household per-capita income (ie, lower vulnerability) can prepare for disaster; hence, they will take action for disaster preparedness regardless of disaster severity. By contrast, for people with lower household per-capita income (ie, higher vulnerability), their disaster preparedness is highly selective because their resources are limited. Only when they experience high disaster severity will they take action for disaster preparedness.

There were several limitations in this study. Due to the limitations of the study design, it is unknown whether other disasters after the Wenchuan earthquake have affected the disaster

preparedness of survivors. In addition, the information on injury or death of household members, relatives, or friends of the interviewed households was not collected and, therefore, cannot be used to measure disaster severity in our study.

Authors contributions. Y.X. was responsible for literature review, formal analysis, data interpretation, drafting, and write-up of the manuscript; J.W. oversaw the whole study and was responsible for data collection, data interpretation, study design, and write-up of the manuscript; Y.H. was responsible for data interpretation, study design, and write-up of the manuscript; Y.Z. was responsible for data collection, editing, writing, and reviewing.

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Appendix

Table 1. Moderating effects of the highest years of schooling between county death and disaster preparedness ($N = 1420$)^a

Parameter	Model 1	Model 2	Model 3	Model 4
	Overall preparedness	Material preparedness	Knowledge and awareness preparedness	Action preparedness
County death rate (%)	0.045 (0.052)	0.013 (0.033)	0.020 (0.021)	0.012 (0.022)
Housing damage (refer to: Collapse)				
Serious damaged	0.095 (0.124)	0.057 (0.078)	-0.0002 (0.050)	0.039 (0.053)
Medium damaged	-0.139 (0.132)	-0.002 (0.083)	-0.074 (0.053)	-0.063 (0.057)
Slightly damaged/No damage	0.089 (0.123)	0.042 (0.077)	0.027 (0.049)	0.020 (0.053)
County death rate (%) * The highest years of schooling	-0.0002 (0.005)	-0.0001 (0.003)	-0.0002 (0.002)	0.00005 (0.002)
The highest years of schooling	0.051*** (0.013)	0.027** (0.008)	0.013* (0.005)	0.012* (0.006)
Per-capita income (logarithm)	0.373*** (0.090)	0.135* (0.057)	0.084* (0.036)	0.155*** (0.039)
Gender (refer to: Female)				
Male	0.186* (0.087)	0.053 (0.055)	0.108** (0.035)	0.025 (0.037)
Age	-0.011*** (0.003)	0.004 (0.002)	-0.006*** (0.001)	-0.009*** (0.001)
Marital Status (refer to: Single/divorced/widowed)				
Married	0.144 (0.110)	0.095 (0.069)	0.123** (0.044)	-0.075 (0.047)
Political status (refer to: None-Communist Party member)				
Communist Party member	0.882*** (0.157)	0.375*** (0.099)	0.125* (0.063)	0.382*** (0.067)
Area (refer to: Rural)				
Urban	-0.137 (0.110)	-0.074 (0.070)	0.023 (0.044)	-0.086 (0.047)
Constant	4.400*** (0.293)	1.153*** (0.185)	2.289*** (0.117)	0.959*** (0.125)
R ²	0.1060	0.0404	0.0674	0.1081
adj. R ²	0.0984	0.0322	0.0594	0.1005

^aStandard errors in parentheses.* $P < 0.05$.** $P < 0.01$.*** $P < 0.001$.

Table 2. Moderating effects of per-capita income between housing damage and disaster preparedness ($N = 1420$)^a

Parameter	Model 1	Model 2	Model 3	Model 4
	Overall preparedness	Material preparedness	Knowledge and awareness preparedness	Action preparedness
County death rate (%)	0.044*	0.013	0.018*	0.014
	(0.020)	(0.013)	(0.008)	(0.009)
Housing damage (refer to: Collapse)				
Serious damaged	0.253	0.169	-0.044	0.129
	(0.178)	(0.112)	(0.071)	(0.076)
Medium damaged	-0.042	0.068	-0.110	-0.001
	(0.188)	(0.119)	(0.076)	(0.081)
Slightly damaged/No damage	0.081	0.033	0.031	0.017
	(0.172)	(0.109)	(0.069)	(0.074)
Housing damage * Per-capita income (logarithm) (refer to: Collapse * per-capita income (logarithm))				
Serious damaged * Per-capita income (logarithm)	-0.307	-0.217	0.084	-0.174
	(0.244)	(0.154)	(0.098)	(0.104)
Medium damaged * Per-capita income (logarithm)	-0.188	-0.138	0.071	-0.121
	(0.269)	(0.170)	(0.108)	(0.115)
Slightly damaged/No damage * Per-capita income (logarithm)	0.016	0.017	-0.007	0.006
	(0.224)	(0.141)	(0.090)	(0.096)
Per-capita income (logarithm)	0.473**	0.203	0.055	0.215**
	(0.175)	(0.110)	(0.070)	(0.075)
The highest years of schooling	0.052***	0.027***	0.013**	0.012*
	(0.012)	(0.008)	(0.005)	(0.005)
Gender (refer to: Female)				
Male	0.193*	0.059	0.106**	0.029
	(0.087)	(0.055)	(0.035)	(0.037)
Age	-0.011***	0.004	-0.006***	-0.009***
	(0.003)	(0.002)	(0.001)	(0.001)
Marital status (refer to: Single/divorced/widowed)				
Married	0.143	0.095	0.123**	-0.075
	(0.110)	(0.069)	(0.044)	(0.047)
Political status (refer to: None-Communist Party member)				
Communist Party member	0.879***	0.373***	0.126*	0.380***
	(0.157)	(0.099)	(0.063)	(0.067)
Area (refer to: Rural)				
Urban	-0.142	-0.078	0.025	-0.089
	(0.111)	(0.070)	(0.044)	(0.047)
Constant	4.343***	1.112***	2.308***	0.922***
	(0.299)	(0.189)	(0.120)	(0.128)
R ²	0.1077	0.0427	0.0683	0.1111
adj. R ²	0.0988	0.0332	0.0591	0.1023

^aStandard errors in parentheses.* $P < 0.05$.** $P < 0.01$.*** $P < 0.001$.

Table 3. Moderating effects of the highest years of schooling between housing damage and disaster preparedness ($N = 1420$)^a

Parameter	Model 1	Model 2	Model 3	Model 4
	Overall preparedness	Material preparedness	Knowledge and awareness preparedness	Action preparedness
County death rate (%)	0.043*	0.013	0.018*	0.013
	(0.020)	(0.013)	(0.008)	(0.009)
Housing damage (refer to: Collapse)				
Serious damaged	0.104	0.341	-0.167	-0.070
	(0.335)	(0.211)	(0.134)	(0.143)
Medium damaged	0.252	0.186	-0.062	0.128
	(0.354)	(0.223)	(0.142)	(0.151)
Slightly damaged/No damage	0.149	0.205	-0.019	-0.038
	(0.322)	(0.203)	(0.129)	(0.138)
Housing damage * The highest years of schooling (Refer to: Collapse * The highest years of schooling)				
Serious damaged * The highest years of schooling	-0.001	-0.030	0.017	0.011
	(0.032)	(0.020)	(0.013)	(0.014)
Medium damaged * The highest years of schooling	-0.041	-0.020	-0.001	-0.020
	(0.034)	(0.022)	(0.014)	(0.015)
Slightly damaged/No damage * The highest years of schooling	-0.007	-0.017	0.005	0.006
	(0.031)	(0.019)	(0.012)	(0.013)
The highest years of schooling	0.062*	0.044**	0.007	0.011
	(0.024)	(0.015)	(0.010)	(0.010)
Per-capita income (logarithm)	0.375***	0.135*	0.084*	0.156***
	(0.090)	(0.057)	(0.036)	(0.039)
Gender (refer to: Female)				
Male	0.186*	0.054	0.107**	0.025
	(0.087)	(0.055)	(0.035)	(0.037)
Age	-0.011***	0.004	-0.006***	-0.009***
	(0.003)	(0.002)	(0.001)	(0.001)
Marital status (refer to: Single/divorced/widowed)				
Married	0.150	0.099	0.123**	-0.072
	(0.110)	(0.069)	(0.044)	(0.047)
Political status (Refer to: None-Communist Party member)				
Communist Party member	0.887***	0.378***	0.126*	0.383***
	(0.157)	(0.099)	(0.063)	(0.067)
Area (refer to: Rural)				
Urban	-0.147	-0.078	0.021	-0.090
	(0.111)	(0.070)	(0.045)	(0.048)
Constant	4.298***	0.987***	2.349***	0.963***
	(0.351)	(0.221)	(0.141)	(0.150)
R ²	0.1072	0.0418	0.0690	0.1115
adj. R ²	0.0983	0.0323	0.0598	0.1027

^aStandard errors in parentheses.* $P < 0.05$.** $P < 0.01$.*** $P < 0.001$.